



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/693,091	10/23/2003	Lotien Richard Huang	10434/60701	8466

26646 7590 02/22/2006

KENYON & KENYON LLP  
ONE BROADWAY  
NEW YORK, NY 10004

EXAMINER
----------

NOGUEROLA, ALEXANDER STEPHAN

ART UNIT	PAPER NUMBER
----------	--------------

1753

DATE MAILED: 02/22/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 10/693,091	<b>Applicant(s)</b> HUANG ET AL.	
	<b>Examiner</b> ALEX NOGUEROLA	<b>Art Unit</b> 1753	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 23 May 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-64 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 1-9, 18-27, 36-45, 47, 49-60, 62, 63 is/are allowed.
- 6) ☒ Claim(s) 10-13, 15-17, 28-31, 33-35, 61 and 64 is/are rejected.
- 7) ☒ Claim(s) 14, 32, 46 and 48 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 October 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 02/14/2005.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☒ Other: IDS of 5/06/2005.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

2. Claims 10-13, 15-17, 28-31, 33-35, 61, and 64 are rejected under 35 U.S.C. 102(a) as being anticipated by Huang et al. ("Role of Molecular Size in Ratchet Fractionation," Physical Review of Letters, vol. 89, no. 17, 21 October 200, 178301-178301-4) ("Huang").

Addressing claim 10, Huang discloses a microfluidic device for separating particles according to size comprising:

a microfluidic channel (Figure 2 and abstract), and an ordered array of obstacles within the microfluidic channel (Figure 2), wherein the device employs a field that propels the particles being separated through the microfluidic channel (Figure 3(b) and related discussion in the second column on page of 178301-3); and the ordered array of obstacles is asymmetric with respect to the average direction of the field (Figures 1(a), 2, and 4(a)), such that, when particles are introduced into the array, particles having a size less than a predetermined critical size are transported in a first direction, and

Art Unit: 1753

particles having a size at least that of the critical size are transported in a second direction, wherein the first and second directions are different, thereby separating the particles according to size (implied by the embodiment of Figures 3(b) and 3(c), which shows T2 DNA (167 kbp) and  $\lambda$  DNA (48.5kbp) laterally separated at 11mm from the injection point).

Addressing claims 11, 12, and 29, 30, for the additional limitations of these claims see Figure 2.

Addressing claims 13, 15, 31, and 33, for the additional limitations of these claims see the caption for Figure 3(b), which implies electrical and electrophoretic fields.

Addressing claims 16, 17, 34, and 35, for the additional limitations of these claims see the first full paragraph in the second column on page 178301-2.

Addressing claim 28, Huang discloses a method for separating particles according to size comprising:

introducing the particles to be separated into a microfluidic channel comprising an ordered array of obstacles (Figure 2 and first full paragraph in the second column on page 178301-2); and

applying a field to the particles to propel the particles through the microfluidic channel (Figures 3(b) and first full paragraph in the second column on page 178301-2),

Art Unit: 1753

wherein the ordered array of obstacles is asymmetric with respect to the average direction of the field (Figures 1(a), 2, and 4(a)), such that, particles having a size less than a predetermined critical size are transported in a first direction, and particles having a size at least that of the critical size are transported in a second direction, wherein the first and second directions are different, thereby separating the particles according to size (implied by the embodiment of Figures 3(b) and 3(c), which shows T2 DNA (167 kbp) and  $\lambda$  DNA (48.5kbp) laterally separated at 11mm from the injection point).

Addressing claims 61 and 64, the examiner has broadly construed the slanted slots at the upper edge of the buffer reservoir in Figure 2 as corresponding to the claimed boundary.

### ***Claim Objection***

3. Claim 1, 18, 36, and 50 are objected to because of the following informality: in line 6 of claims 1, 18, and 50 and line 7 of claim 36 "components" should be -- component -- . Appropriate correction is required.

***Allowable Subject Matter***

4. Claims 1-9, 18-27, 36-45, 47, 49-60, 62, and 63 are allowed.
5. Claims 14, 32, 46, 48 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.
6. The following is a statement of reasons for the indication of allowable subject matter:
  - a) Claims 1, 18, 36, 50: the combination of limitations in each of these claims requires that "... a flux of the field from the gaps is divided unequally into a major flux component and a minor flux component into subsequent gaps in the network such that the average direction of the major flux component is not parallel to the average direction of the field ..."

Huang et al. ('Role of Molecular Size in Ratchet Fractionation,' Physical Review of Letters, vol. 89, no. 17, 21 October 2000, 178301-178301-4) ("Huang") discloses an asymmetric array of microfabricated obstacles for sorting biomolecules, such as DNA. Although Huang discloses that the electric field lines may have a major flux component and minor flux component (Figure 1(a)),

Art Unit: 1753

a minor flux component for the electric field is clearly not desired and the system is configured to avoid it: "To isolate deflection due to diffusion, it is required that *all* field lines through an upper gap ["A" in Fig. 1(b)] map through a lower gap ("B'), which is aligned to the upper map [emphasis added]" (see the second full paragraph in the first column one page 178301-2) and "To generate the desired aligned current distribution of Fig. 1(b), the array edges to which equipotentials are applied should be along the calculated equipotential direction" (see the third full paragraph in the first column one page 178301-2). Furthermore, the particles are transported generally in the average direction of the field; that is, the average direction of the major flux component is aligned with the average direction of the field (See Figures 1, 3(a) and (b), and 4(a), and (b)).

b) Claims 2-9, 45, and 60 depend directly or indirectly from allowable claim 1.

c) Claims 14 and 32: the combination of limitations in each of these claims requires that the field be a fluid flow. In Huang the field is electrical or electrophoretic. See Figures 1, 2, and 3(b).

d) Claims 19-27, 47, and 63 depend directly or indirectly from allowable claim 18.

e) Claims 37-44, 49, and 62 depend directly or indirectly from allowable claim 36.

f) Claim 46: the combination of limitations requires "a first output configured to accept particles transported in the first direction and a second output configured to accept particles transported in the second direction."

In Huang there is only one output, the bottom buffer reservoir shown in Figure 2.

g) Claim 48: the combination of limitations requires "introducing the particles transported in the first direction into a first output and the particles transported in the second direction into a second output."

In Huang there is only one output, the bottom buffer reservoir shown in Figure 2.

h) Claims 51-59 depend directly or indirectly from allowable claim 50.

### ***Inventorship***

7. In view of the papers filed May 23, 2005, it has been found that this nonprovisional application, as filed, through error and without deceptive intent, improperly set forth the inventorship, and accordingly, this application has been



Art Unit: 1753

corrected in compliance with 37 CFR 1.48(a). The inventorship of this application has been changed by adding Robert Austin as an inventor.

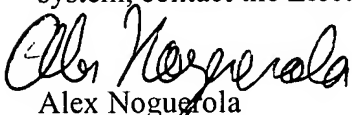
The application will be forwarded to the Office of Initial Patent Examination (OIPE) for issuance of a corrected filing receipt, and correction of Office records to reflect the inventorship as corrected.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to ALEX NOGUEROLA whose telephone number is (571) 272-1343. The examiner can normally be reached on M-F 8:30 - 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, NAM NGUYEN can be reached on (571) 272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 1753

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Alex Noguera  
Primary Examiner

AU 1753

February 20, 2006